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GAS ABSTRACTS

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O. P. BRYSCH, Editor

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1. GAS INDUSTRY

Alberta Exports?

WILL ALBERTA ALLOW LPG EXPORTS? *Petrol. Week 4*, 29-30 (1956) January 25.

Right now, Alberta officials are committed to a "province-first" LPG policy: They want petrochemical plants to settle there, not to tap Alberta resources from a distance. The official feeling is that, if Alberta keeps its LPG within the province, it can attract manufacturers of synthetic rubber, plastics, fertilizers, and other petrochemical products. Editor's Abstract

El Paso Market

EL PASO GAS PUSHES NEW FRONTIER. *Business Week*, No. 1430, 76-78, 81-86 (1957) January 26.

The deal between Paul Kayser of El Paso Natural Gas Co. and Ray Fish of Pacific Northwest Pipeline Corp. puts El Paso in possession of the gas market for the entire Far West.

Editor's Abstract

Engineers Salaries

ARE ENGINEERS UNDERPAID? *Mech. Eng. 79*, 165-68 (1957) February.

This article is based on three papers discussing rewards of engineering and considers a number of aspects of the subject. Before presenting actual salary data, other rewards for engineering are mentioned: 1) job satisfaction, and 2) freedom in devising methods and solutions for most of his work. The data compare salaries in engineering with other professions, and median salaries of different engineering age groups. The 1950 census gives median incomes of physicians, lawyers, dentists and engineers as $8115, $6257, $6232, and $4700. These figures all seem low when compared to results of other surveys given here, but they are useful for ratios. As of 1950, U. S. Dept. of Labor shows median salaries of engineers rising from $7300 at age 35-39 to $10,000 at 55-59. The most disturbing statistic is the comparison of experienced engineers' salaries with those of skilled labor. In 1940, the ratio of new engineers' salaries to skilled labor was 0.65; for 15 years experience the ratio was 1.95. In 1951 the ratios were, respectively 0.7 and 1.25. It is concluded that, compared to the legal and medical professions and skilled labor, the engineer is generally underpaid. C. L. Tsaros

Future Power Demand

Federal Power Commission. ESTIMATED FUTURE POWER REQUIREMENTS OF THE UNITED STATES BY REGIONS 1955-1980. FPC P-30, Federal Power Commission (1956) December.

Federal Power Commission forecasts show the electric power loads of the U. S. increasing from 103 million kw in 1955 to 335 million kw in 1980. Since the reserve capacity has been approximately 11% in 1955 and is expected to increase to 15% by 1980, the following projection of total generating capacity is made: for 1960, 161 million kw; 1965, 210; 1970, 321; 1980, 386. The southeastern region of the U. S. has experienced the fastest growth in power consumption during the last 10 years, due mainly to the increased use of electricity in homes and in residential heating. The greatest potential market, it is believed, for increasing electric power sales lies in residential applications. Residential use increase is anticipated from 2690 kwh per home in 1955 to 7000 kwh in 1980. Now some 49 million farm and nonfarm homes nearly all have central station service; however very few homes are totally electrified. The totally electrified home requires some 20,000-25,000 kwh per year. Electric sales to commercial users represent only about 17% of total utility sales while industrial uses represent by far the largest proportion of sales. Residential sales are expected to nearly equal or to exceed industrial sale in the distant future. The largest industrial consumption of electricity is in the primary metals industries such as aluminum refining, followed by chemical industries, and then by paper and pulp industries. Total sales in 1955 were over 500 billion kwh and the requirements in 1980 are thought to be 1800 billion kwh.

C. G. von Fredersdorff

Gas Price

Ralph, H. D. WHAT DOES IT COST TO FIND GAS? *Oil Gas J. 55*, 120-25 (1957) March 11.

The growth of the natural gas industry depends on the answer to the question of cost of developing future reserves. Replacement cost of the gas being consumed is the key to the required

real price of gas and to the volume of future supplies. New discoveries requiring deep-zone drilling are very costly, and these costs must be borne by the gas sales and not by borrowed financing out of earlier cheaper byproduct gas, or oil production. Low prices to the producers, enforced by governmental and political regulation only hasten the bankruptcy or confiscation of the producers. The risk element in gas production must be measured (at least 12 percent return according to Phillips Petroleum) and price determined from this risk compensation (and not from a scarcity market) by the FPC, if regulation is to give a just reasonable return to attract investment of capital. Charts and tables by Phillips to FPC are used to indicate present unbalanced competitive position of gas. O. P. Brysch

Personnel

Boynton, S. D. WHAT DO OILMEN WANT IN THE TECHNICAL MAN (BESIDES ABILITY)? *Petrol. Processing 12,* 66-67 (1957) January.

This article answers some of the questions as to what, besides technical proficiency, is required of the modern engineer. The answers were obtained by interviewing the top and middle management of refining, research and engineering companies in various sections of the country. The five items brought to light by the survey were skill in communication, getting along with others, supervisory skill, salesmanship, and a concern for health. Most of these were considered as important as engineering skill by the executives. K. Bischoff

Campbell, J. M. WANTED: MORE AND BETTER ENGINEERS. *Pipe Line Ind. 6,* 52, 54 (1957) January.

Whether the U. S. is losing the technological race with Russia is a matter of much debate. If we are losing, it is because of our failure to attract enough students into engineering — and to offer them a superior education after they enter the field. Here is a sound appraisal of the problem. Author's Abstract

Edgerton, H. A. HOW TO GET TOP RESULTS FROM INTERVIEWS. *Pipe Line Ind. 6,* 56, 59 (1957) January

Interviews are the most used — and misused — personnel tools in the oil industry. Here is a candid discussion of the most common faults in modern interviewing methods, plus an excellent outline designed to help you improve interviewing skills. Editor's Abstract

NEW AMMO IN FIGHT FOR GRADS. *Business Week,* No. 1428, *170* (1957) January 12.

Industry is putting chunks of its advertising budgets into novel gimmicks to bring its message to the campus. Editor's Abstract

Pipeline Forecast

Judah, M. A. BIG CONSTRUCTION INCREASE FORECAST FOR '57. *Pipe Line Ind. 6,* 22-23 (1957) January.

The coming year may well be a record one in pipeline construction around the world. *Pipe Line Industry's* annual industry forecasts 16,850 miles of new gas, oil and products lines during 1957. Installation of compressor and pumping horsepower totaling 555,790 is also predicted. Author's Abstract

Utility Insurance Problems

Gillespie, R. S. 19-POINT CHECKLIST FOR INSURANCE. *Gas Age 119,* 27-31, 46 (1957) January 24.

An appraisal of past and present indicates that most of the deficiencies which followed the large scale introduction of natural gas are being encountered with less frequency. However, some do persist and probably the most active cause of loss currently is failure to control the activities of contractors engaged in highway and street construction and improvement. Correction is essential to the best interests of life, property and utility relations with the consuming public. Author's Abstract

Writer Training

Rathbone, R. R. ENGINEER-WRITERS ARE MADE NOT BORN. *Research and Eng. 3,* 22-23, 43 (1957) January.

The enormous growth of industry and technology has been exceeded in quantity only by one other activity — writing. Reports, proposals, memoranda, articles, all are required by a product: and all — in sheer volume — outweigh it. The demand for writers is greater than the supply; and engineers and supervisors are drafted to stop the gap. Here is a program to help correct the literary deficiencies of the draftees. Author's Abstract

2. APPLIANCES

Air Conditioning

Gaulin, R. P. AIR CONDITIONING THE HOSPITAL. *Air Cond., Heat. and Ventiltg. 54,* 74-88 (1957) January.

Personal comfort is the motive, in most cases, for installation of air conditioning systems. However, in hospitals, important factors are its therapeutic value, air sanitation, and the welfare of hospital patients. Each part of the hospital presents special design problems as regards temperature, humidity and air circulation which must be understood. Suggested design conditions are presented, as well as a discussion of the various systems that should be considered. In this article, air conditioning refers to the simultaneous control of temperature, humidity, air movement and cleanliness of air to provide a constant optimum condition within the hospital, regardless of the season of the year. Supplementary information is included. Author's Abstract

JET PRINCIPLE APPLIED TO HOME AIR CONDITIONER IN NEW RHEEM UNIT. *Gas Age 118,* 34-35 (1956) November 1.

A new central air conditioning unit operating on a single gas burner is planned by Rheem for marketing in 1958. Unit features application of the jet principle of cooling previously useful in only commercial or industrial applications. A change from heating to cooling is obtained by means of a conventional thermostat.

A. E. Richter

Appliance Production

A PROGRESS REPORT: ONE YEAR OF WHIRLPOOL-SEEGER. *Appliance Manuf. 5,* 41-108 (1957) January.

A very interesting series of articles is presented on the organization, operation and outlook of Whirlpool-Seeger. R. T. Ellington

Burners

Drake, L. H. MIXING AND TURBULENCE PRODUCING MEANS FOR A GAS BURNER TIP. U. S. 2,776,706 (1957) January 8.

Van der Lee, A. (assigned to Hartford National Bank and Trust Co.) SELF-GASIFYING PETROLEUM GAS BURNER. U. S. 2,775,292 (1956) December 25.

Goulding, C. E., Sr. CROSS DRAFT BURNER. U. S. 2, 776,001 (1957) January 1.

Warnecke, R. I. (assigned to Roberts-Gordon Appliance Corp.) GAS BURNER AND CONSTANT PILOT. U. S. 2,772,730 (1956) December 4.

Convective Transfer

Bevans, J. T. HEAT-TRANSFER STUDIES — VERTICAL FREE CONVECTION FROM AN ISOTHERMAL SURFACE. *Ind. Eng. Chem. 49,* 114-19 (1957) January.

The free convection from a vertical isothermal plate has been investigated extensively, both theoretically and experimentally. The theory is based on the assumption of the intiation of heating and the induced flow at the same point. Past experimental studies have been concerned with measurement of the heat transfer under these conditions. However no specific results have been presented for the laminar heat transfer from a vertical section following an unheated forward section, i. e. unheated started length. The results of the studies were that the effect of an unheated starting length upon free convection from a vertical plate is negligible within experimental accuracy. The work was expanded to include the determination of the heat transfer below an obstruction placed above the point of initiation of the heated section. It was found that the obstruction of free convection along the side of a vertical surface extends upstream to a critical Grasshoff and Prandtl modulic product. G. Kunst

Heating Inspection

Hansen, M. STREAMLINING SPACEHEATING INSPECTION. *Gas Age 119,* 13-16, 48 (1957) January 24.

Installation and inspection problems inherent in a six-fold increase in use of natural gas for spaceheating are met by backing a close company inspection with special training of dealers. Author's Abstract

Ignition

Johnson, L. E. and Musat, G. (assigned to The Babcock and Wilcox Co.) GAS IGNITER FOR PULVERIZED COAL BURNERS. U. S. 2,777,-512 (1957) January 15.

Miller, J. W. (assigned to Motor Wheel Corp.) SAFETY CONTROL FOR A GAS FUEL BURNER. U. S. 2,776,000 (1957) January 1.

Safety Stove Valve

Reiser, H. and Aschkenas, A. *Child-Proof Gas Cock Controls.* U. S. 2,780,333 (1957) February 5.

Utilization Problems

ADVANCES IN GAS UTILISATION. *Coke and Gas* (British) *19,* 30-34, 37 (1957) January.

Recent papers on interchangeability and its problems are reviewed. New data are presented on the flow phenomena in long simple flues and on the film coefficients in flues. R. T. Ellington

Ventilation

SE-DUCT ASSISTS IN FLAT DESIGN, *Ind. Gas* (British) *20,* 26-27 (1957) January.

Of interest to all architects and builders, especially those concerned in the design and construction of blocks of flats, is a new system of central flue ducting recently designed by the South Eastern Gas Board Editor's Abstract

Water Heaters

Bremer, H. F. (assigned to Carbon Heater Corp.) ELECTRICAL WATER HEATER. U. S. 2,776,359 (1957) January 1.

Klemp, S. and Doenges, H. (assigned to Johann Vaillant Kommandit Ges.) VALVE FOR GAS WATER HEATERS. U. S. 2,774,565 (1956) December 18.

Water Heater Design

DESIGN HIGH INPUT GAS WATER HEATER. *Amer. Gas Assoc. Monthly 38,* 9, 50 (1956) December.

Research results on a variety of contemporary gas water heaters are reviewed. Three burner types and two internal-flue and one external-flue models were used for variation. A much higher input rate can be successfully applied to storage-type water heaters than is commonly used in contemporary models. An experimental 30-gal heater with drilled port burner, combination external and internal fluency, matched the recovery capacity of a contemporary 60-gal model. Editors' Abstract

3. COMBUSTION AND INDUSTRIAL FURNACES

Flame Research

Hottel, H. C., Toong, T. Y., and Martin, J. J. FLAME STABILIZATION IN A BOUNDARY LAYER. *Jet Propulsion 27,* 28-30, 48 (1957) January.

The theory of flame stabilization is examined by studying the stability of a lean propane-air flame in the boundary layer along a water-cooled slender rod, with its longitudinal axis lying at the center line of a large Pyrex duet. The extraneous dilution effect due to surrounding atmosphere present in the study of the stability of a Bunsen flame is thus eliminated. The position of the flame from the leading edge of the slender rod is found to be independent of the rod position inside the duct and of the duct length, unless the flame is stabilized within 2 in. of the duct exit. This indicates that, except in the latter region, the stable flame position is determined by the flow characteristics in the boundary layer along the rod. The distance between the flame and the leading edge of the rod decreases as the free stream mixture velocity decreases, the rod coolant temperature increases, and the propane-air ratio increases from lean toward the stoichiometric value. For a given coolant temperature, the velocity gradient at the rod surface, calculated at the stable flame positions by assuming a Blasious velocity profile in the boundary layer, is correlated with the propane-air ratio. The experimental scatter is approximately ± 10 per cent. Authors' Abstract

Huellmantel, L. W., Ziemer, R. W., and Cambel, A. B. STABILIZATION OF PREMIXED PROPANE-AIR FLAMES IN RECESSED DUCTS. *Jet Propulsion 27,* 31-34, 43 (1957) January.

The principal dynamic characteristics of a pump fed, variable thrust, bipropellant, liquid rocket engine system are established over a broad thrust range by analog computer simulation of the nonlinear physical elements. Several basic types of control elements are studied, and a control system capable of meeting a stringent set of transient performance requirements is synthesized. The results of this study are of general applicability to rocket engine system

design since the effect of the intrinsic system nonlinearities upon performance at various thrust levels is established. Transient and frequency response characteristics of the nonlinear system are determined for both small and large changes in thrust level. Correlation between the general nonlinear equations and the linear equations which describe the rocket engine system for perturbations about any fixed thrust level is shown. Authors' Abstract

Heat Treatment

Phillips, W. A. (assigned to Surface Combustion Corp.) APPARATUS FOR TREATING A STRIP OF METAL. U. S. 2,775,825 (1957) January 1.

An apparatus is claimed for passing a strip of metal at an elevated temperature through two successive chambers containing different atmospheres under slightly different pressures. The strip of metal is permitted to pass from one chamber to the other through an opening which prevents the atmospheres of the 2 chambers from mixing or equalizing in pressure. G. Kunst

STUDIES OF EFFECT OF METHANE IN HEAT TREATING FURNACE ATMOSPHERES. *Ind. Heating 24,* 56-58, 62 (1957) January.

A report is made of the work being done by one manufacturer on the effect of methane on furnace work by use of new instrumentation. R. T. Ellington

Luminous Flames

Comerford, F. M., COMBUSTION OF CARBON PARTICLES IN LUMINOUS FLAMES. *Fuel 35,* 3, 333-342 (1956) July; *Appl. Mech. Rev.,* Abs. No. 310, *10,* 42 (1957) January.

In order to obtain information on the rate of combustion of carbon particles in luminous flames, the shape of the luminous soot zone and the variation of the spectral emissivity along the length of a preheated propane-air diffusion flame burning in hot surroundings have been studied. The air supply to the flame was controlled and the ratio of the air flow to that required for complete combustion was found to be far more important in determining the length of the soot zone than the relative velocities of the air and gas streams. The emissivity measurements can be explained by assuming that the reaction rate of air and soot particles is fast compared with the diffusion rate of the air, so that the latter determines the shape of the soot zone. Author's Summary

Ore Reduction

Priestley, R. J. FLUIDIZED SOLIDS TECHNIQUE: MAGNETIC CONVERSION OF IRON ORES. *Ind. Eng. Chem. 49,* 62-4 (1957) January.

Fluid reduction of low-grade hematite to magnetite is discussed, with application of laboratory results to commercial practice. Effect of grinding and importance of dust recovery are emphasized. Steps in the design of a projected commercial plant, with flowsheet and schematic, are given, and the economics of operation are shown for coal fuel and gas fuel.

O. P. Brysch

4. CARBONIZATION AND GASIFICATION

Carbonization

Nathan, M. F., Lobo, W. E., and Skaperdas, G. T. (assigned to M. W. Kellogg Co.) COAL CARBONIZATION. U. S. 2,775,551 (1956) December 25.

Fluidized carbonization of wet pulverized coal is achieved by providing a unitary vessel subdivided into drying and preheating zones superimposed upon a carbonizing zone, with a pretreating (oxidation) zone arranged at the bottom of the carbonizing zone, this pretreating zone being fed by gravity through a long standpipe from the heating zone, and discharging through an open grid upwardly into the carbonizing zone well below the level of the dense-phase bed therein. Thus, the raw wet coal, fed into a bed of fluidized preheated coal, is raised in temperature to 220° to 325° F., and when dried, passes to an adjacent indirect (tubular) oil heater which raises the temperature to 350° to 600° F. This preheated coal is returned to the first vessel for mixing with the wet feed, and also for passing downward to the pretreater zone, where partial combustion raises its temperatures to 600° to 825° F. Here some volatiles are driven off and rise with the coal through the grid top and mix with fluidized coal in the carbonizing bed, where temperatures

range from 700° to 1000° F. because of further partial combustion, in achieving final devolatilization. O. P. Brysch

Coal Chemicals

Jones, W. I. COAL AS A RAW MATERIAL. *Royal Inst. Chem.* No. 3 (British) 1956.

This survey concerns coal as a source of fuel, coke, gas, chemicals and raw materials for organic chemical synthesis. High temperature carbonization of coal yields coke, with tar, benzol and ammonia as by-product. Organic chemicals derived from these include polycyclic aromatics, benzene, phenols, toluene, xylenes and naphthas. Although the steel industry is the largest consumer of coke, other important uses of coke are for ammonia and methanol synthesis. Low temperature carbonization yields solid smokeless fuel and also gives higher tar yields and a greater range of chemicals. For the production of gas for heating purposes, extensive development work is being done on the complete gasification of solid fuels using cheap and low-grade coals. Hydrogenation of coal has been studied for the production of gasoline and chemicals. Coal and coal by-products are being used for the production of electrode carbons, carbon black, active carbons and carbon ceramics. Recently, the recovery from coal gasification of the inorganic by-products germanium and gallium has aroused interest. As atomic energy begins to supply a part of the power requirements, coal may become still more important for metallurgical reduction, gasification and for use in chemical, oil and other industrial processes. E. J. Pyrcioch

Coal Plastometer

Hills, D. C. A NEW COAL PLASTOMETER. *Amer. Soc. Test. Materials Bull.* No. 218, 34-39 (1956) December.

An improvement on the widely-used Gieseler coal plastometer is described, with comparisons of results of the two. A 1/16 x 3/8 x 1-5/8 inch rectangular paddle, initially packed in the through-40-mesh coal charge, is rotated at constant torque in an elongated brass tubular retort, heated to maintain a temperature rise of 3° C. per minute by a gas burner. Greater precision is claimed because of reduced frothing, slippage, and bearing troubles, and faster, more convenient operation is attainable.

O. P. Brysch

Coal Pyrolysis

Chermin, H. A. G. and Van Krevelen, D. W. CHEMICAL STRUCTURE AND PROPERTIES OF COAL XVII — A MATHEMATICAL MODEL OF COAL PYROLYSIS. *Fuel* (British) *36*, 85-104 (1957) January.

A mathematical model has been postulated by means of which the pyrolysis of coal can be interpreted quantitatively. The model which is based on the consecutive reaction theory, enables a satisfactory explanation of the degasification and the plastic behavior of coking coal to be given. The activation energy of the pyrolysis of coking coal was found to be about 50 kcal/mole. This value is in good agreement with the results of earlier experiments.

Authors' Abstract

Cyclone Separators

Minsky, E. M. and Korchazhkin, M. T. CALCULATION OF FLOW CAPACITY OF CYCLONE SEPARATORS. *Gazovaya Promysh.* (Russian) (Gas Industry) No. 12, 1-6 (1956).

Equations are developed for the design of cyclone separators based on analogy between the action of gas streams in cyclones and in centrifugal disc atomizers. These equations were checked by tests on actual equipment. A special design of cyclone with discontinuous discharge pipe within the cyclone is described. Examples of design calculations are given. J. W. Penney

Gasification

Jequier, L. (assigned to Amonia Casale S. A. Italy) GASIFICATION METHOD. U. S. 2,772,954 (1956) December 4.

An apparatus is described for gasifying fine solid fuels such as coal slack in a fixed bed cone-bottom generator and for utilizing the hot product gases for preheating the gasification media of air or oxygen and steam in one of several alternate heat exchanger designs.

E. J. Pyrcioch

Ogorzaly, H. J. (assigned to Esso Research and Eng. Co.) SOLIDS PUMP APPLIED TO COAL GASIFICATION. U. S. 2,774,635 (1956) December 18.

This system for feeding coal particles from a storage bin at low pressure into a gasifier operating at elevated pressures employs a system of closed circuit standpipes in which mer-

cury is circulated by a pump between the low and high pressure zones. Transfer of coal takes place by entrainment of the particles in the mercury stream. E. J. Pyrcioch

Zemelman, B. IMPROVEMENT OF EFFICIENCY OF PLANTS GASIFYING SOLID FUELS AT HIGH PRESSURE. *Gazovaya Promysh.* (Russian) (*Gas Industry*), No. 12, 7-9 (1956).

A plan is proposed to improve the efficiency of high pressure gasification plants by recovery of electrical energy using gas expansion turbines. An overall plant efficiency of 47% is claimed for a plant gasifying solid fuel at 25 atmospheres pressure, purifying gas at 25 atmos. and pumping gas to distribution at 20 atmospheres. J. W. Penney

Indirect Ammonia

Ruehl, G. BEITRAG ZUR FRAGE DER VERWERTUNG VON GASWASSER. I. MOEGLICHKEITEN DER GEWINNUNG VON KOKEREI-STICKSTOFF UND-SCHWEFEL NACH DEM INDIREKTEN VERFAHREN. (CONTRIBUTION TO THE QUESTION OF USE OF GAS SCRUBBING WATER. I. POSSIBILITIES OF RECOVERY OF COKE PLANT NITROGEN AND SULFUR BY THE INDIRECT PROCESS.) *Brennstoff-Chemie* (German) *38*, 27-32 (1957) January 9.

A general review of the recovery procedures of by-products from gas scrubbing is presented in a chronological order. All contributions, patents and industrial applications are mentioned as well as their modifications in Europe and the United States up to 1956. It is also interesting to note, that the old indirect recovery procedure for ammonia is revived completely by the modern technical improvements. G. Kunst

Peat

Piret, E. L. and White, R. G. PEAT: AN IMPORTANT RAW MATERIAL? *Chem. Eng. Progress 52*, 94, 96, 98 (1956) November.

One-half (7 billion tons) of U. S. peat resources are located in Minnesota. Fuel economics here has prevented the development of fuel uses, as in Ireland, Finland and Sweden. Studies of non-fuel uses are going on in Quebec, Finland, Belgium, France, Holland and Russia, by government and industrial groups. Resins, waxes, humic acids, fertilizer, and activated carbons have been produced. University of Minnesota, with state commission aid, has been embarked since 1954 on a long-range research program for developing basic knowledge of peat and its chemical uses. O. P. Brysch

Oil Gasification

Termany, F. J. GASIFYING APPARATUS. U. S. 2,775,513 (1956) December 25.

A fuel-oil gasifier according to claim 1, with an internal conical baffle cup in a primary combustion chamber beneath and closely adjacent said high-voltage arc terminals for bouncing the gas back toward said terminals.

Selected Extracts

Pressure Coking

Schmidt, H. DIE SCHWELUNG UNTER MECHANISCHEM DRUCK. (CARBONIZATION UNDER MECHANICAL PRESSURE). *Brennstoff-Chemie* (German) *38*, 19-23 (1957) January 9.

A laboratory apparatus is described and illustrated whereby lignites, brown coals and other ordinarily non-caking carbonaceous fuels are heated to about 400° C. while under mechanical pressure of about 300 kg/sq cm (4260 psig) to yield strong coherent lump coke. This coherence is not attained at the cost of tar yields as obtained by the Fischer assay. Cokes of densities up to 1.3 g/cu cm and crushing strengths over 4200 psig have been obtained, depending on whether pressure was applied continuously from the start of heating, or at a later time. From this apparatus a semi-plant coking device was developed for continuous production of dense lumps. O. P. Brysch

Producer Gas

Bark, S. E. and Dmitriev, E. N. INCREASING BTU OF PRODUCER GAS BY UTILIZATION OF WASTE HEAT. *Gazovaya Promysh.* (Russian) (Gas Industry), No. 12, 13-15 (1956).

Btu of producer gas was increased from 133 to 139 by preheating steam and combustion air with the sensible heat of producer gas. Producer gas was cooled from 510° C. to 210° C. in a tubular steam superheater and the heat absorbed by the steam was used in air preheater before the steam was added to the combustion air. Water sprays were used inter-

mittently to remove dust from tubes. Flow diagram and detailed drawing of superheater are given. J. W. Penney

Synthesis Gas

Merkel, H. (assigned to Koppers Co., Inc.) PROCESS FOR THE PRODUCTION OF CARBON MONOXIDE AND HYDROGEN FROM METHANE OR THE LIKE. U. S. 2,773,756 (1956) December 11.

A process is described for the production of synthesis gas of a relatively low nitrogen content without impairing the activity of an iron conversion catalyst employed, which comprises subjecting to partial combustion a mixture of a normally gaseous hydrocarbon and a gas consisting of oxygen and oxygen-enriched air, to hereby form a gaseous product of partial combustion comprising carbon monoxide, carbon dioxide, steam, and unreacted normally gaseous hydrocarbon, admixing said gaseous product with an amount of synthesis gas sufficient to produce a gaseous mixture in which the partial pressure of the steam and of the carbon dioxide are reduced to the value which would be obtained of the gaseous product was produced as the result of subjecting to partial combustion a mixture of said normally gaseous hydrocarbon and air of normal oxygen content, and thereafter passing the thus-produced gaseous mixture into the iron catalyst to convert said gaseous product to synthesis gas consisting primarily of carbon monoxide and hydrogen. Selected Extracts

Tar Settling

Kulik, M. D. (assigned to Pittsburgh Consolidation Coal Co.) PROCESS FOR REMOVING FINELY DIVIDED SOLIDS FROM RAW LOW TEMPERATURE CARBONIZATION COAL TARS. U. S. 2,774,716 (1956) December 18.

This patent describes a process for separating finely divided solids from low-temperature carbonization coal tar by agglomerating the solids with a portion of the tar itself. The separation is brought about by mixing the solid-laden tar with a solvent consisting of 0.5 to 3.0 volumes of predominently nonaromatic low-temperature tar distillates fraction having a boiling endpoint below 200° C., and containing 2 to 20 percent by volume of tar acids. Proper adjustment of tar acids causes rejection of some raw-pitch which agglomerates the fine suspended solids. After separating the rejected pitch and agglomerated solids by filtration, the solvent is recovered by distillation and recycled.

K. C. Channabasappa

5. NATURAL GAS AND NATURAL GAS CONDENSATES

Corrosion in Wells

Bock, M. CORROSION PREVENTION IN GAS CONDENSATE AND SWEET OIL WELLS. *Petrol. Eng. 29*, B111, 114, 116, 118, 120, 122 (1957) January.

Causes and detection of corrosion in tubing, casing, and other well equipment are reviewed, as well as fundamentals of determining extent of corrosion and economic use of materials, methods and inhibitors to prevent damage.

Author's Abstract

Menaul, P. WHAT CAUSES CORROSION IN PUMPING WELLS? *World Oil 144*, 157-59 (1957) January.

Corrosion in pumping wells is one of the petroleum industry's top production problems. This simple explanation of the electrolytic, galvanic and chemical reactions taking place in your well may help you to understand the problem more fully. Author's Abstract

Drilling

de Chastelain, A. G. G. HOW 16 WELLS WERE DRILLED DIRECTIONALLY. *Oil Gas J. 55*, 99-101 (1957) January 7.

Inaccessible locations have necessitated considerable directional drilling in Canada. Profitable use of this technique depends highly on the skill and the attention of the operator. Important also is the use of directional surveys to determine the best way of hole deflection. Knowing how formation dip will affect hole deflection helps minimize directional drilling time and costs. Author's Abstract

LeVelle, J. A. NEW MAGNETIC PARTICLE BRAKE. *Petrol. Eng. 29*, B47-52 (1957) January.

Eddy-current type unit has constant braking torque independent of drum speed, is light weight and compact, and adaptable to well servicing and big rigs. Author's Abstract

Morrisey, N. S. DRILLING CONTRACTORS OFFER BEST BUY IN THE OIL BUSINESS. *Oil Gas J. 55*, 123-25 (1957) January 7.

This article compares 1951 and 1956 drilling costs for various well depths and formation. A number of reasons are given for the cost reductions accomplished in this period.

R. T. Ellington

Ragland, D. EFFECT OF MODERN DRILLING TECHNOLOGY ON WELL COST. *Petrol. Eng. 29*, B33-36 (1957) January.

Well costs have been kept at 1950 levels — thanks to technological improvements made in the drilling industry. Annual research expenditures, now estimated at $12,500,000, must be stepped up to meet many new and existing problems. Author's Abstract

Ilfrey, W. T. and Prokop, C. L. (assigned to Esso Research and Eng. Co.) METHODS OF DRILLING WELLS. U. S. 2,776,112 (1957) January 1.

Vance, J., WELL DRILLING APPENDAGE OR DEVICE. U. S. 2,776,111 (1957) January 1.

Williams, E. B., Jr. DRILL BIT. U. S. 2,776,115 (1957) January 1.

Exploration

Fowler, P. SOUTH CENTRAL TEXAS' FAULTS AND FOLDS. *Oil Gas J. 55*, 162-71 (1957) January 14.

The author discusses the main structural features of this South Central Texas area and the ages of movement, and interprets the structural information as regards igneous and metamorphic activity. R. T. Ellington

Flow

Sobocinski, D. P. and Huntington, R. L. CALCULATING 3-PHASE FLOW IN HORIZONTAL LINES. *Pipe Line Ind. 6*, 43-45 (1957) January.

Extensive data from studies over a wide range of flow conditions give many of the answers to these complex flow problems. Here is a big step forward from expensive and time-consuming trial-and-error solutions. Authors' Abstract

Fracturing

Scott, J. O. THE WHY AND HOW OF FRACTURING. *Oil Gas J. 55*, 91-107 (A-G), (1957) January 14.

Although fracturing did not start until 1949, it's now hitting about 5,000 wells per month. And it is estimated that about 20 per cent of all producing wells in the United States have been fractured. However, about 25 per cent of the fracture treatments have not been successful, and it behooves a careful operator to consider all the angles carefully before he makes the decision to fracture. Here is a guide to the practical information that is needed to make a good decision. Author's Abstract

Gain in Reserves

Amer. Gas Assoc. U. S. NATURAL GAS RESERVES SHOW GREATEST ANNUAL GAIN ON RECORD. A. G. A. Public Infmtn. Bur. Letter 5-N (1957) March 15.

The eleventh annual Joint Report of the A.G.A.-A.P.I. Committee on Natural Gas Reserves giving proved recoverable reserves at end of 1956 issued today. Total reserves of 1956 are 237.774 trillion SCF, a gain of 14.077 trillion over the 223.697 trillion reported Dec. 31, 1955. Gas net production reached 10.9 trillion, as compared with 10.1 trillion SCF in 1955. Natural gas liquids likewise set new records in 1956, with reserves gaining 463,767,000 bbl to total 5,902.3 million bbls and production gaining 25,653,000 bbl to total 346.053 million bbls. Tabulations by state and type of extension are included. O. P. Brysch

Logging

Kokesh, F. P. (assigned to Schlumberger Well Surveying Corp.) ELECTRICAL WELL LOGGING. U. S. 2,776,402 (1957) January 1.

Youmans, A. H. (assigned to Well Surveys, Inc.) METHOD AND APPARATUS FOR RADIOACTIVITY WELL-LOGGING. U. S. 2,776,378 (1957) January 1.

Pipeline Control

Jackel, A. P. DATA TELELOGGING IN PIPELINING. *Oil Gas J. 55*, 112-16 (1957) January 14.

A new approach to the method of supplying all of the remote controls at remotely controlled stations with a minimum of communication-line facilities. The new system provides for ob-

taining this information within a period of seconds and for immediate telelogging the data to the home office. Author's Abstract

AUTOMATION: KEY TO SOUND EXPANSION. *Gas Age 119*, 9-12 (1957) January 24.

To meet its rapidly growing service requirements, Lone Star Gas Co. counts heavily on automated office procedures, and decentralization of distribution based on self-sufficient district service centers linked by radio to fleet units. Editor's Abstract

Pipelines

Anderson, O. U. S. CONTRACTORS CONQUER SPANISH TERRAIN. *Pipe Line Ind. 6*, 34-35 (1957) January.

U. S. and Spanish contractors teamed up to lick mud and granite on a 481-mile jet fuel line. This new line connects seven key Strategic Air Command bases in Spain. Its unusual design features give high operating dependability. Author's Abstract

Smith, F. A. RIGHT-OF-WAY PROBLEMS ARE EVERYBODY'S BUSINESS. *Pipe Line Ind., 6*, 36-40 (1957) January.

Here is an objective look at the problems pipe line engineers and land departments meet in acquiring right-of-way for cross-country lines. Applying these ideas can lead to "tailor made" policies to fit specific needs. Author's Abstract

Reservoir Engineering

Jacoby, R. H., Berry, V. J., Jr. A METHOD FOR PREDICTING DEPLETION PERFORMANCE OF A RESERVOIR PRODUCING VOLATILE CRUDE OIL. T. P. 4448. *J. Petrol. Tech. 9*, 27-33 (1957) January.

Future depletion performance and ultimate oil recovery from reservoirs producing under volumetric control are often predicted with the aid of a material balance equation. In order to improve volatile oils, a stepwise method of calculation has been developed. This method uses relative permeability data and multicomponent flash calculations to predict oil and gas production as a function of reservoir pressure. Authors' Abstract

Reudelhuber, F. O. and Hinds, R. F. A COMPOSITIONAL MATERIAL BALANCE METHOD for PREDICTION OF RECOVERY FROM VOLATILE OIL DEPLETION DRIVE RESERVOIRS. (T. P. 4449.) *J. Petrol. Tech. 9*, 19-33 (1957) January.

Application of the conventional depletion drive calculation methods to volatile oil reservoirs result in erroneous estimates of ultimate recovery. In view of the increasing number and importance of volatile oil reservoirs, a special technique has been developed which will result in more realistic predictions using laboratory data obtained from reservoir fluid studies of a specific type. Authors' Abstract

Russian Gas Industry

Lippitt, H. F. II. AS RUSSIA STRAINS TO EXPAND ITS NATURAL-GAS INDUSTRY. *Oil Gas J. 54*, 178, 181 (1956) December 31.

A summary of the current status of Russia's natural gas pipeline system and of plans for the expansion of these system. A map on which current and proposed pipelines are sketched is included. G. G. Wilson

Well Practice

Garrett, H. U. and Taylor, D. M. PARALLEL MACARONI STRING CUTS WELL COSTS. *Petrol. Eng. 29*, B38, 40-44 (1957) January.

On 19 wells from 2300 to 7500 ft. deep, macaroni string parallel to tubing cemented in open hole cuts cost from 30 to 50 per cent of conventional completion. Authors' Abstract

Kastrop, J. E. NEW SHAPED CHARGE PACKS BIGGER WALLOP. *Petrol. Eng. 29*, B66-68, 72 (1957) January.

A new method of forming the gas jet in deeper penetration of the producing formation has been developed. This results from shaped charges. R. T. Ellington

Poulter, T. C. Caldwell, B. M. THE DEVELOPMENT OF SHAPED CHARGES FOR OIL WELL COMPLETION. (T. P. 4446.) *J. Petrol. Tech. 9*, 11-18 (1957) January.

A theoretical study was made of the underlying principles whereby a jet is formed by a shaped charge and of the mechanism of the penetration of the target by that jet. It was found that there are more than 10, and perhaps as many as 15 variables affecting the performance of the

shaped charge. Only a few calculations are necessary to show that it is physically impossible to investigate all of these variables experimentally. The development of a design whereby these phenomena are coordinated in such a way as to develop a jet which is tailored to meet the specific target requirement will be described in detail. Authors' Abstract

6. PETROLEUM AND SYNTHETIC LIQUID FUELS

Alkylate

Resen, L. REFINING-PROCESSING: EASTERN STATES ALKYLATES MIXED FEED. *Oil Gas J., 55,* 108-10 (1957) January 14.

The sulfuric acid alkylation unit at Eastern States Petroleum Co.'s Houston refinery employs a single vessel with six reaction zones as a cascade reactor. Amylene content of the feed stock has varied from 7 to 18 per cent of the olefin feed, while propylene content has been relatively constant at 26-29 per cent.

Author's Abstract

Coking of Residues

Shea, F. L., Jr. (assigned to Great Lakes Carbon Corp.) PRODUCTION OF COKE FROM PETROLEUM HYDROCARBONS. U. S. 2,775,549 (1956) December 25.

It is an object of the present invention to produce a coke having a needle-like or splintery structure which is less porous than the usual type of coke and which has a high metallic sheen or luster, from charging stocks not suitable for this purpose when coked by known processes. One embodiment of the invention comprises heating a heavy petroleum residue at a temperature of 325°-500° C. for a time sufficient to form a precipitate, separating the liquid oil from the insoluble material formed, and subjecting the liquid oil to homogeneous coking conditions in a quiescent pool maintained without agitation except for the natural movement of vapors evolved during coking, and recovering the coke thus formed.

Selected Extracts

Cracking Yields

QUESTIONS ON TECHNOLOGY. *Oil Gas J. 55,* 126 (1957) January 14.

How yields in catalytic cracking may be estimated. A correlation chart and selected references. Author's Abstract

Fischer-Tropsch Synthesis

Johnson, W. B. COAL BEATS OIL HERE. *Petrol. Refiner 35,* 222-28 (1956) December.

In South Africa, Sasol plant produces chemicals and fuels from coal via Fischer Tropsch reaction. Here's how the units were designed, started up and operated. Author's Abstract

Fracturing

Patterson, B. F., Jr. HYDRAULIC FRACTURING IN THE CADDO-PINE ISLAND FIELD. *J. Petrol. Tech. 9,* 11-16 (1957) January.

This paper describes briefly the geology, development history, present drilling and completion practices, and the results of the hydraulic fracturing process in stimulating the production from Annona Chalk in the Caddo-Pine Island field, Caddo Parish, La. In order to show results of the various completion techniques, production histories on several wells are presented and comparisons of the production from individual or groups of wells before and after fracturing operations are discussed. Author's Abstract

Geophysical Instruments

Germain-Jones, D. T. POST WAR DEVELOPMENTS IN GEOPHYSICAL INSTRUMENTATION FOR OIL PROSPECTING. *J. Sci. Instr.* (British), *34,* 1-8 (1957) January.

A brief discussion of advances made in geophysical instrumentation for oil prospecting in the last 12 years. R. R. Amrine

India Oil

Skeet, T. H. H., L.L. B. THE INDIAN PETROLEUM INDUSTRY. *Petroleum 19,* 425-30 (1956) December.

Vast changes are occurring in India, and the petroleum industry will have to foreshadow events and plan accordingly. In this article the author examines the influence of the Socialist policy of the government, and in the light of the information now available reviews the effect of the second five year plan on ownership, exploration, production, refining, transportation and marketing. Authors' Abstract

Isotope-Traced Plugging

Hower, W. F., and Ramos, J. SELECTIVE PLUGGING OF INJECTION WELLS BY IN

SITU REACTIONS. *J. Petrol. Tech. 9,* 17-20 (1957) January.

The use of a relatively short half-life radioactive isotope, in a new procedure, led to the development of a process for determining the distribution of injection water. This new tool made possible the investigation of water injection profiles in many wells in the Illinois area. Findings pointed toward many wells having a very unequal water distribution and an immediate need for remedial action. In some cases, a reduction in permeability of a certain zone was indicated, while other conditions showed the necessity of completely plugging a relatively narrow horizon. Field applications to cure both conditions were applied successfully in the Illinois area in 1955 and have since been used successfully in Oklahoma. Authors' Abstract

Lubrication Problems

Lowther, H. V. HOW TO TEST ENGINES FOR OIL LOSS. *Pipe Line Ind., 6,* 25-26 (1957) February.

Three ways are described to measure oil consumption of an engine. Each method considers engine design, condition, operating performance and oil properties. R. R. Amrine

Terres, E. and Morlock, G. ZUM STAND DER THEORIE DER GLEITLAGERSCHMIERUNG. (THE POSITION OF THEORY IN THE LUBRICATION OF SLIDE BEARING). *Erdoel und Kohle* (German) 10 9-14 (1957) January 1.

Two theories about the lubrication of bearings are presented and compared. The hydrodynamic theory holds that the metal surfaces are separated by a continuous layer of lubricant, and the viscosity of the lubricant represents the only variable. The "mixed friction" theory assumes that more than one condition of lubrication exists at the same time, namely that the layer of lubricant is sometimes partially interrupted. Both theories are justified and their viewpoints are described in detail. G. Kunst

Tar Sands Treatment

ROYALITE TAPS ATHABASCA TAR SANDS. *Oil Gas J. 55,* 66-67 (1957) January 21.

A centrifugal separation process has been developed which may spark development of the world's largest known oil deposits.

R. T. Ellington

Shale Oil

Trager, E. DON'T OVERLOOK OIL SHALE. *World Oil 144,* 177, 178, 182-188 (1957) January.

There is a 100 billion-barrel untapped oil reserve at least in Colorado's oil shale. With discovery and production costs rising constantly, it won't be long before someone starts mining oil at a profit. Author's Abstract

Thermal Drive

Schild, A. A THEORY FOR THE EFFECT OF HEATING OIL PRODUCING WELLS. *J. Petrol Tech.* T. P. 4447 *9,* 1-10 (1957) January.

The effect of heating a producing well on the rate of oil recovery has been analyzed in the simple case of a well producing oil by a radial drive and in the steady state. Differences of production rates with and without borehole heating have been calculated and plotted on the assumption that the heaters used are 100 per cent efficient. Author's Abstract

Water Flooding

Powell, J. P. OHIO OIL'S BRYDEN-LADD WATER FLOOD TREATING PLANT. *Oil Gas J. 55,* 118 (1957) January 14.

Water from this treating plant is used to flood 537 acres of Kansas Bartlesville sand at 2,400 ft. Four wells, completed in the Douglas formation at 1,400 ft. provide water for the flood. Estimated oil saturation at the beginning of water injection was 48 per cent.

Author's Abstract

7. ANALYTICAL METHODS AND TESTS

Copper in Oils

Zall, D. M., McMichael, R. E., and Fisher, D. W. DETERMINATION OF COPPER IN FUEL OIL AND OTHER PETROLEUM PRODUCTS. PRODUCTS. *Anal. Chem. 29,* 88-90 (1957) January.

An accurate and simple spectrophotometric method for the determination of copper in petroleum products uses neocuproine (2,9-dimethyl-1, 10=phenanthroline) for the development of the copper-neocuproine complex, which has a maximum absorbance at 450 mu. The method is rapid and direct and requires no ashing of the sample. No pH adjustment or extraction is necessary. The results compare

favorably with those of other more tedious and time-consuming methods. Authors' Abstract

Infrared Techniques

Bellamy, L. J. APPLICATIONS OF INFRARED SPECTROSCOPY IN CHEMICAL INDUSTRY. *Chem. and Ind.* (British), No. 2, 26-28 (1957) January 12.

This paper contains a discussion of the correlations connecting infrared frequencies and molecular structure. E. Mann

Cannon, C. G. APPLICATIONS OF INFRARED SPECTROSCOPY IN CHEMICAL INDUSTRY. *Chem. and Ind.* (British) No. 2, 29-33 (1957) January 12.

This paper contains a discussion of the infrared techniques used to study structural details of fibres used in the textile industry. General analytical applications are also discussed.

E. Mann

Lube Oils

MICROCHEMISTRY IN LUBRICATING OIL ANALYSIS. *Lubrication 43,* 1-12 (1957) January.

A general discussion of macro analytical chemistry reduced to micro analytical chemistry and its advantages to the petroleum industry.

R. R. Amrine

Moisture in Coal

Crawford, A. DETERMINATION OF THE MOISTURE CONTENT OF THE 'ANALYSIS' SAMPLE. *Fuel* (British) *36,* 7-25 (1957) January.

This paper places on record the results of certain experimental work available to the B.S.I and I.S.O. Committees responsible for drafting both British and International Standards for the analysis of solid fuel. It is concerned with the determination of moisture in the 'analysis' sample of coal, and deals with the period ending June 1955.

Author's Abstract

Nitrogen Oxides

Thomas, M. D., MacLeod, J. A. Robbins, R. C., Goettelman, R. C., Eldridge, R. W., and Rogers, L. H. AUTOMATIC APPARATUS FOR DETERMINATION OF NITRIC OXIDE AND NITROGEN DIOXIDE IN THE ATMOSPHERE. *Anal. Chem. 28,* 1810-16 (1956) December.

Nitric oxide and nitrogen dioxide in the atmosphere can be determined continuously with automatic sampling and recording apparatus. Two special absorbers are employed for absorption of nitrogen dioxide in a modified Griess reagent followed by colorimetric recording. One absorber measures the nitrogen dioxide alone; the other measures nitrogen dioxide plus nitric oxide after the latter has been oxidized by ozone, permanganate, or chlorine dioxide. Concentration limits of the instrument range up to about 1 p.p.m., but they can be considerably extended or reduced. Standard error is about ±5%. Authors' Abstract

Organic Disulfides

Stahl, C. R. and Siggia, S. DETERMINATION OF ORGANIC DISULFIDES BY REDUCTION WITH SODIUM BOROHYDRIDE. *Anal. Chem. 29,* 154-55 (1957) January.

A method is presented for the determination of organic disulfides by reduction to the mercaptan with sodium borohydride and aluminum chloride and titration of the mercaptan with silver nitrate. Authors' Abstract

Petroleum Composition

Mair, B. J., Marculaitis, W. J., and Rossini, F. D. SEPARATION OF THE C18 to C25 FRACTION OF PETROLEUM. *Anal. Chem. 29,* 92-100 (1957) January.

The heavy gas oil and light lubricating oil fraction, C18 to C25, of the representative Midcontinent petroleum of the API Research project 6 was separated into an aromatic portion and a paraffin-cycloparaffin portion by adsorption with silica gel. The aromatic portion was further separated by adsorption with alumina into portions containing mononuclear, dinuclear, and trinuclear aromatics. The paraffin-cycloparaffin portion was further separated by treatment with urea into a concentrate of n-paraffins was fractioned by distillation at very low pressure to give concentrates of the individual n-paraffin hydrocarbons. These latter were separately subjected to crystallization to yield purified samples of the individual n-paraffins, C18 to C24. Taking the C18 to C25 fraction as 100%, the relative amounts of the several types of hydrocarbons separated from this fraction of this petroleum are, in percentage by volume: total aromatics, 25.2; mononuclear aromatics, 12.2; dinuclear aromatics, 7.9; tri-

nuclear aromatics, 5.1; n-paraffins, 17.1; branched paraffins plus cyclo-paraffins, 56.3; residue, 1.4. Authors' Abstract

Petroleum Control

Duncan, J. M. STATISTICAL QUALITY CONTROL IN A PETROLEUM CONTROL LABORATORY. *Amer. Soc. Test. Mat. Bull.*, No. 219, 40-43 (1957) January.

A program designed to keep laboratory management informed of the degree of control and precision of a test and to tell when corrective action is needed with a minimum expenditure of manpower. Author's Abstract

Radioisotopes

SHELL PUTS RADIOISOTOPES TO WORK. *Oil Gas J. 55*, 111-13 (1957) January 7.

These case histories outline several instances where engineers of Shell Oil Co. and Shell Development Co. have used radioactive isotopes to improve refining operations.

Author's Abstract

Water in Oil

Callinan, T. D., Roe, R. M., and Romans, J. B. FACTORS AFFECTING USE OF DIELECTRIC METHODS IN DETERMINATION OF SEA WATER IN NAVY SPECIAL FUEL OIL. *Anal. Chem. 28*, 1911-16 (1956) December.

The dielectric constant, per cent power factor, dielectric loss factor, and conductivity of a number of boiler fuels were evaluated as a means of measuring the sea water content of Navy Special fuel oils on shipboard. These properties varied considerably from one fuel oil to another at comparable frequencies from 10 kc. to 75 Mc. When these oils were emulsified with synthetic sea water, the values so obtained increased with increasing sea water content but remained a function of the characteristics of the original fuel oil. The necessity of using a dry reference sample is emphasized.

Authors' Abstract

8. GENERAL AND PHYSICAL CHEMISTRY

Adsorption

Gundry, P. M. and Tompkins, F. C. CHEMISORPTION OF GASES ON NICKEL FILMS. PART I: KINETIC STUDIES. *Faraday Soc. Trans.* (British) *52*, 1609-17 (1956) December.

The kinetics of the sorption of hydrogen and carbon monoxide on nickel films has been investigated at low temperatures for a wide variety of conditions. The general conclusions previously drawn from the results obtained for the iron + hydrogen system are confirmed. However, in addition, some new results have suggested that the previous theory of activated surface migration required modification, although under the presintering conditions used in the present work, the slow process must still be considered as a surface phenomenon. Following a suggestion of Dowden, i. e. introducing an intermediate chemisorbed state which must be passed through before the sorbed atom (or molecule) attains its final equilibrium state, it is shown that the previous concept of a non-uniform surface is not essential. Provided the free energy of adsorption falls linearly with amount sorbed over a small range at high coverage, the Elovich equation may be deduced and the apparent redistribution of "sites" of varying adsorption potential following certain conditions of "thermal cycling" can be simply interpreted. The usefulness of this model to other problems of absorption is brief indicated.

Authors' Abstract

Trapnell, B. M. W. PARAFFIN SORPTION ON CLEAN METALS. PART I: THE BEHAVIOUR OF DIFFERENT METALS TOWARDS CH_4 AND C_2H_6. *Faraday Soc. Trans.* (British) *52*, 1618-22 (1956) December.

Small amounts of CH_4 and C_2H_6 are readily sorbed at —78° C there may be some chemisorption of CH_4 on W, but there is very little on Mo. The sorbed amount tends to increase with temperature, but in no case is the surface completely covered at 70° C. No CH_4 sorption and very little C_2H_6 sorption takes place on Fe, Co and Ni films up to 70° C., possibly because the presence of ferromagnetism raises the activation energy of sorption. On W, Mo and Rh, hydrogen is liberated from C_2H_6 layers above 0° C., and on Rh at 70° C. the amount which is liberated indicates breakdown of hydrocarbon within the monolayer at least to C_2H_4 radicals. The bearing of the results on the catalysis of paraffin-deuterium exchange is briefly discussed and it is suggested that the activity of a metal is decided more by the velocity than by the heat of paraffin sorption. Author's Abstract

Catalysts

Danziger, B. H. and Milliken, J. R. MOLYBDENUM IN PETROLEUM REFINING. Part II. *Petrol. Eng. 28*, C12-15 (1956) December.

Uses of molybdenum in catalysts for reforming, desulfurization, isomerization, and polymerication in MoS2 additives for lubrication, and in corrosion-resistant alloys are discussed.

D. M. Mason

Katz, M., Riberdy, R., and Grant, G. A. THE OXIDATION OF CARBON MONOXIDE BY SOLID SILVER PERMANGANATE REAGENTS. VI. REACTION KINETICS AND ADSORPTION OF WATER VAPOR. *Can. J. Chem. 34*, 1719-29 (1956) December.

Four adsorption isotherms for water vapor on this reagent have been obtained in the range of —10° to 20°C. The isotherms are sigmoid and indicative of Type II adsorption. The mechanism of this heterogeneous reaction is discussed on the basis of several possibilities for providing oxygen ions in the electron-ion exchange step of the over-all reaction.

Authors' Abstract

Compressibility

Trube, A. S. COMPRESSIBILITY OF NATURAL GASES. (Tech. Note 398) *J. Petrol. Tech. 9*, 69-71 (1957) January.

The purpose of this paper is to clarify the definition of compressibility and to present a uniform basis upon which instantaneous compressibilities of imperfect gases are derived and the concept of pseudo-reduced compressibility is introduced. Part of the data presented by Brown, Katz *et al.* on compressibility factors for natural gases has been rearranged. A graph of pseudo-reduced compressibility vs. pseudo-reduced pressure for various pseudo-reduced temperatures is presented. The need for additional work in relating the compressibilities of liquids and gases is discussed.

Author's Abstract

Equilibria

Johnson, A. I. and Furter, W. F. ALGEBRAIC REPRESENTATION OF VAPOR-LIQUID EQUILIBRIUM DATA. *Can. J. Tech. 34*, 429-41 (1957) January.

The relative merits of algebraic vs. thermodynamic correlations of non-ideal vapor-liquid binary equilibrium data are discussed. A survey of previous attempts at algebraic representation is given. A rapid and easily handled algebraic representation is proposed that meets the criteria for such expressions, containing only two empirical constants both readily evaluated from a simple straight-line plot, relating x and y directly, and permitting the calculation of azeotropic compositions. Its merit lies in its simplicity. The equation was subjected to a critical test with 57 different binary systems. It was found to represent, in general, systems containing no strongly polar or long-chained components and, in the more limited case, systems in which both components are polar but are of somewhat similar molecular types and sizes, and degrees and types of polarity. The accuracy was better than one per cent over the ranges for which data were available. For these types of systems, the equation is concluded to be useful from a practical standpoint for engineering calculations such as the calculation of azeotrope compositions, and for representing experimental, non-ideal vapor-liquid equilibrium data within the described limitations.

Authors' Abstract

Heat Capacities

Johnson, A. I. and Huang, C. J. ESTIMATION OF IDEAL GAS HEAT CAPACITIES OF HYDROCARBONS. *Can. J. Techn. 34*, 405-09 (1957) January.

From the data of the American Petroleum Research Institute Project 44, equations relating group contributions of heat capacity for the ideal gas state to temperature were obtained. These contributions are easily summed to yield equations relating ideal gas heat capacity of hydrocarbons to temperatures over the range 300° K. to 1500° K. The accuracy of the equations is good and their use for interpolation is easy.

Authors' Abstract

9. ORGANIC CHEMISTRY

Acetylene

Kohl, A. L. and Riesenfeld, F. C. (assigned to The Fluor Corp., Ltd.) SEPARATION OF ACETYLENE COMPOUNDS. U. S. 2,773,560 (1956) December 11.

Several methods for separating methyl acetylene and other higher acetylenic compounds from acetylene-bearing gas streams are described.

H. L. Feldkirchner

Millard, E. H., Jr. (assigned to Olin Mathieson Chemical Corp.) SEPARATION OF ACETYLENE FROM ETHYLENE BY HYDROCHLORINATION OF THE ETHYLENE. U.S. 2,779,805 (1957) January 29.

A method for separating ethylene and acetylene is described whereby the ethylene is converted to ethyl chloride by hydrochlorination. The remaining acetylene stream is then available for further reaction to desired products.

H. L. Feldkirchner

Naphthalene Absorption

Van Ackeren, J. (assigned to Koppers Company, Inc.) METHOD AND APPARATUS FOR NAPHTHALENE ABSORPTION. U. S. 2,776,021 (1957) January 1.

An improved method for removal of naphthalene from water streams as found in coke-oven by-product recovery systems is described. The water stream is contacted countercurrently with an immiscible liquid stream of higher density in such a manner that liquid carryover from one stream into the other is minimized. (See *Gas Abs. 13*, 47: Faingold, S. G.)

H. L. Feldkirchner

Selective Hydrogenation

Waterman, H. I., Weber, A. B. R. and Zweekhorst, C. SELECTIVE ANALYTICAL HYDROGENATION OF OLEFINIC DISTILLATES. *J. Inst. Petroleum* (British) *42*, 349-54 (1956) December.

Several catalysts were tested for the selective hydrogenation of olefins (no dearomatization) in kerosene fractions. Starting materials and hydrogenation products were separated into aromatics, olefins and saturates with silica gel by the Fluorescent Indicator Adsorption method, a catalyst was considered to be selective if olefins were reduced to less than one volume percent, and aromatics were unchanged. Even at low temperatures, Ni on kieselguhr, Pd on active carbon, Raney nickel and a Platforming catalyst were not strictly selective. Selective hydrogenation over molybdenum on active carbon (100 atm, 300° C.) and over Pt on silica-alumina (10 atm, 120° C.) was possible. The latter catalyst is preferred, because of the milder conditions which would prevent side reactions.

E. B. Shultz

10. CHEMICAL ENGINEERING

Cooling Towers

Engalitcheff, J. COUNTER-FLOW COOLING TOWER SELECTION AND PERFORMANCE CHART. *Refrig. Eng. 64*, 35-39, 90-92 (1956) December.

Counter-flow cooling tower selection and performance chart affords selection and offers complete analysis and prediction of tower performance from any single known operating point.

Author's Abstract

Ion Exchange

Peak, R. F. and David, M. M. COSTS OF CATION EXCHANGE EQUIPMENT. *Chem. Eng. Progress 53*, 37J-40 (1957) January.

This paper points up the vacuum which has existed for some time in the ion exchange literature and fills in many of the gaps. For the chemical engineer who is considering the installation of water-softening equipment or who is involved in fixed-bed ion exchange processes, the data supplied here can serve as a permanent guide in estimating rough costs and in the choice of suitable equipment.

Authors' Abstract

Selke, W. A., Bard, Y., Pasternak, A. D., and Aditya, S. K. MASS TRANSFER RATES IN ION EXCHANGE. *Amer. Inst. Chem. Eng. 2*, 468-70 (1956) December.

The rates of both the liquid-phase mass transfer and the internal-diffusion steps in ion exchange were studied by means of shallow-bed experiments. The mass transfer coefficients obtained fitted the general correlations for other packed-bed operations when the Schmidt group was evaluated with experimentally determined ionic counter-diffusivities. An incremental calculation of the diffusion rates within the particles yielded a value of the counterdiffusivity in the resin phase. A general design procedure based on these findings is proposed.

Authors' Abstract

Jet Absorption

Cullen, E. J. and Davidson, J. F. ABSORPTION OF GASES IN LIQUID JETS. *Faraday Soc. Trans.* (British) *53*, 113-20 (1957) January.

The rate of absorption of carbon dioxide into a jet of water is measured and compared satis-

factorily with the calculated theoretical value. The jet, which is required to have uniform velocity across every section, is produced in a specially designed orifice. With a jet issuing from a long straight tube, in which the water is in laminar flow, the absorption rate is lower than the calculated value. This is thought to be caused by a hydrodynamic entry effect. With water contaminated by a surface active agent (Teepol), a stagnant layer end effect is produced. Evidence is presented which supports the idea that this is a free energy phenomenon.
Authors' Abstract

Plant Design

Freese, C. E. HERE ARE AMMONIA PLANT DESIGN TIPS. *Petrol. Refiner 36,* 193-197 (1957) January.

This article discusses the mechanical design problems encountered in high-pressure vessels, tubing, flange connections, and compressors and valves. There are also comments on liquid-air plants and equipment. R. T. Ellington

Roberts, K. S. EXPANSION JOINTS HOW TO SELECT AND MAINTAIN THEM. *Petrol. Refiner 36,* 155-160 (1957) January.

The various types of joints are described and the factors to be considered in selecting them and designing a complete piping system.
R. T. Ellington

Water Costs

Nelson, W. L. COST OF TREATING AND COOLING EQUIPMENT. *Oil Gas J. 55,* 132 (1957) January 7.

A scheme of cost indexing is presented which can be used to derive current costs of water treating and cooling equipment. R. T. Ellington

11. PROCESS EQUIPMENT AND INSTRUMENTATION

Dew Point Control

Hanna, R. A SIMPLIFIED DEW POINT CONTROLLER. *Ind. Heating 23,* 2585-88 (1956) December.

A new configuration of controller depending upon the electrical conductivity of a hygroscopic solution-impregnated element is decribed. R. T. Ellington

Instrument Design

Wahl, A. M. RECENT RESEARCH ON FLAT DIAPHRAMS AND CIRCULAR PLATES WITH PARTICULAR REFERENCE TO INSTRUMENT APPLICATIONS. *Amer. Soc. Mech. Eng. Trans. 79,* 83-87 (1957) January.

A discussion and literature survey of recent thoretical and experimental developments relating to flat plates and diaphragms is given, with particular reference to applications in pressure-measuring instruments. Developments discussed include: effects of large deflections; initially buckled diaphragms; plates subject to plastic flow; analysis of temperature and acceleration effects in diaphragms for pressure measurement. Some discussion of instruments utilizing flat or nearly flat diaphragms is given and an attempt is made to indicate possible fruitful avenues of future research in the diaphragm field. Author's Abstract

Haringx, J. A. DESIGN OF CORRUGATED DIAPHRAGMS. *Amer. Soc. Mech. Eng. Trans. 79,* 55-64 (1957) January.

Three previous papers by the author set forth methods of calculating the rigidity of corrugated diaphragms, the stresses in the sheet material, and the non-linearity of the relation between load and deflection. As a further step, the introduction of a few simplifying restrictions having no fundamental effect on the problem leads to the concept of a chart giving at once the dimensions a diaphragm must have so as to conform to specific requirements. An example is included by way of illustration.
Author's Abstract

Process Automation

Campbell, J. M. ELEMENTS OF FIELD PROCESSING—26: SIZING OF RELIEF EQUIPMENT. *Oil Gas J. 55,* 101-02 (1957) January 21.

Aids are presented for sizing relief devices for both vapors and liquids. R. T. Ellington

Minet, R. G. and Mirkus, J. D. COST-SAVING TECHNIQUES FOR INSTRUMENTING A FLUIDIZED BED PILOT PLANT. *Chem. Eng. Progress 52,* 531-34 (1956) December.

Based on experience in the instrumentation of a pilot plant for the continuous fluidized carbonization of bituminous coal some useful guides are presented for keeping down the initial instrumentation costs of a pilot plant.
E. J. Pyrcioch

Williams, T. J. AUTOMATION TODAY: *Petrol. Refiner 36*, 199-201 (1957) January.

It is often necessary to sample the process stream as part of the control loop for the chemical process. This article discusses the types and sources of inaccuracies which may exist for the sampling components of the automatic control system. R. T. Ellington

Radiant Heater

Morrow, R. NEWLY DESIGNED PROCESS HEATER IS TURNING IN GOOD PERFORMANCE. *Oil Gas J. 55*, 88-91 (1957) January 21.

The author proposes a design to give more efficient utilization of costly radiant-section tube surface by double-firing tube banks.
R. T. Ellington

12. MATERIALS OF CONSTRUCTION

Aluminum Pipelines

Dalrymple, R. S. UNDERGROUND ALUMINUM GAS LINE. *Corrosion 12*, 26-28 (1956) December.

A protected and an unprotected length of aluminum line pipe were buried at the same time and put into use. The longer length was protected by coating with a grease-type sealant followed by a wrap of dielectric material; the shorter length was put into the ground unprotected. One month after the wrapped aluminum was installed a cathodic protection survey was performed. By means of a field test it was determined that a current requirement of only 97 milliamperes polarized the aluminum line from a potential of -0.85 volt to -1.00 volt referred to a saturated copper sulfate electrode. The two lines were dug up at the end of five years and examined for corrosion. The insulating gaskets of the unprotected pipeline were found to be in good condition; the unprotected line was superficially stained over its entire length but the stain was of no significant depth. In spite of these findings the atuhor thought it necessary in future operations to adequately coat aluminum lines and to supply the modest requirements for cathodic protection in order to eliminate the hazards of soil corrosion and electrolytic corrosion.
Authors' Abstract

Cathodic Protection

Ambler, C. W., Jr. PIPELINE PATROL: ZINC ANODES PROVIDE LONG-LIFE DESIGN. *Oil Gas J. 54*, 155-56 (1956) December 17.

A brief summary of the properties of zinc as a galvanic anode and of the relative merits of zinc for magnesium, zinc, and rectifier and ground bed installations are included.
G. G. Wilson

Brady, H. A. HOW MAGNESIUM ANODES RETARD CORROSION. *World Oil 144*, 160-62 (1957) January.

Proper application of magnesium anodes, including cost figures, current requirements and installation procedures are covered concisely in this presentation. The increased use of sacrificial anodes as a means of controlling corrosion makes this a timely article. Author's Abstract

George, P. F., Newport, J. J., and Nichols, J. L. A HIGH POTENTIAL MAGNESIUM ANODE. *Corrosion 12*, 51-57 (1956) December.

Extensive research work on magnesium alloy anodes has produced a new high potential material which will deliver from 20-30 percent more current to a polarized cathode than the conventional alloy anodes presently employed. Data obtained from these tests further indicate that this new anode exhibits marginally less current efficiency in normal soils when compared with Grade A Mg-6 percent Al, 3 percent Zn alloy, whereas, in saline environments the ampere-hour recovery from this high potential anode is equal to or greater than that obtained from Grade A magnesium alloy. Polarization characteristics and corrosion patterns observed with the new anode are comparable to those seen on the conventional Mg-6 percent Al, 3 percent Zn Alloy. A comparison of microstructures from commercial magnesium and the new alloy offers a possible mechanism explaining the superiority of this new material as a sacrifical anode. This is based on the coating of impurity particles with manganese rendering them less harmful as contaminants. Field data presented by cooperating companies verify the claimed current output advantage of the new high potential anode when measured against a polarized cathode, and demonstrate the dependence of the incremental advantage on the cathode-to-

soil solution potential. The economics of cathodic protection using galvanic anodes favor the use of the high-potential anode in almost all applications. Authors' Abstract

Prasil, A. G. HOW TO FIND 'HOT SPOTS' THAT REQUIRE CATHODIC PROTECTION. *Gas Age 118*, 36-37 (1956) December 13.

Wisconsin Public Service Corp. has applied 'hot spot' protection to 121,000 ft. of bare steel main from 4 to 6 inch diam. Two methods of locating 'hot spots' are outlined. One of the methods is a soil resistivity survey usually performed with an apparatus called "Shepard's Cane". Values below 1000 ohm-cm are almost never corrosive. The values between 1000 and 10,000 ohm-cm must be interpreted with immediate adjacent sections. The second method of locating hot spots is done by means of a pipe-to-soil potential survey. The records show a practical absence of leaks, and because of the hot spot protection, all of the steel feeder lines are not expected to be replaced within the next 110 years. G. Kunst

Cements

Wells, L. S. and Carlson, E. T. HYDRATION OF ALUMINOUS CEMENTS AND ITS RELATION TO THE PHASE EQUILIBRIA IN THE SYSTEM LIME-ALUMINA-WATER. *J. Res. Nat. Bur. Standards 57*, 335-53 (1956) December.

A study was made of the reaction of water at room temperature on eight aluminous cements covering a wide range of composition. The results are compared with data previously obtained from similar tests on the calcium aluminates, and are discussed in the light of more recent studies of the system CaO-Al_2O_3-H_2O. Like the less basic calcium aluminates, the aluminous cements give rise to metastable monocalcium aluminate solutions from which $2CaO.Al_2O_3$-$8H_2O$ and Al_2O_3-aq are gradually precipitated until the concentration has fallen to about 0.19 gram of Al_2O_3 and 0.46 gram of CaO per liter. From this point, true equilibrium is approached very slowly, the stable solid phases being $3CaO.Al_2O_3.6H_2O$ and macrocrystalline gibbsite ($Al_2O_3H_2O$). The precipitated Al_2O_3.aq is shown to be a microcrystalline form of gibbsite. It is suggested that this phase is the principal "inorganic glue" of aluminous cements. The process of aging to macrocrystalline gibbsite is accelerated by increased temperature, and probably is the chief cause of the decreased strength of aluminous cements at higher temperatures. Authors' Abstract

Coatings

Fair, Jr. W. F. PROPERTIES, SPECIFICATIONS TESTS AND RECOMMENDATIONS FOR COAL TAR COATINGS. *Corrosion 12*, 608t—10t (1956) December.

Principal characteristics of cold applied coal-tar coatings are considered with respect to applications. After reviewing the prerequisites of surface preparations, criteria for selection with respect to the exposure are considered. Five classes of coatings produced by one or more manufacturers are itemized and their general characteristics outlined. Care in selection of primer is emphasized, and types of acceptable primers to be used under coal tar coatings mentioned. After reviewing briefly the problem of water vapor permeability the author discusses the theory of transmission and gives definitions of transmission rate, permeance and permeability. Methods whereby these characteristics may be evaluated with respect to a specific coating are given. Results of an investigation of vapor transmission rates for three classes and one system of coatings are tabulated. Permeance of commonly used building materials is tabulated. Recommend coal tar systems for numerous exposures of piling, pipe, and other metal structures are given.
Authors' Abstract

Parker, M. E. PIPELINE PATROL: POLYETHYLENE TAPE PROVES VALUE. *Oil Gas J. 55*, 133-34 (1957) January 14.

Latest results of a projected long-term test of the value of polyethylene-tape pipe wrap as compared to conventional coating materials indicated a superiority of 3:1, when compared on the basis of current required for cathodic protection. Author's Abstract

Corrosion

Minchin, L. T. ANAEROBIC CORROSION *Coke and Gas* (British) *18*, 495-97, 504 (1956) December.

An excellent, tho brief, review of the theory of

anaerobic corrosion and of the current status of investigations of methods of preventing this type of corrosion. G. G. Wilson

Metals

Barrett, C. S. LOW-TEMPERATURE BRITTLENESS. *Metal Progress 70,* 68-72 (1956) December.

Scientific investigations of metallurgical behavior at low temperature have shown the interrelation between brittle fracture of ship plate and many of the physical properties which are determined by crystalline perfection.

Author's Abstract

13. NEW BOOKS

(C. A. Simms, Librarian)

Chemical Engineering

Cremer, H. and Davies, T. CHEMICAL ENGINEERING PRACTICE. VOLUME I: GENERAL: VOLUME II: SOLID STATE. New York: Academic Press Inc., London: Butterworths Scientific Publicns, 1956.

The method of presenting the subject of chemical engineering in twelve volumes has great merit. The average non-chemical engineer certainly would appreciate the scope of the subject after looking over these volumes. Only the first two volumes are available at present so this review will be limited to their material. Volume I presents elementary material on subjects such as history, economics, unit operations, thermodynamics, kinetics, combustion and others. These fields are presented in a very readable form. A person trained in another field of engineering would certainly learn much about the above subjects by studying from these texts. However, the authors attempt to cover such a large field that they can only touch briefly on each subject and this fact will limit the use of the text in chemical engineering schools. A typical example of the superficial fashion of treating the material is the subject of flame temperatures on page 200. The authors ignore all equilibria that affect flames at these temperatures. The calculation might be satisfactory for non-technical people but it will not be satisfactory for schools. Volume II deals with material which is usually covered by service courses in physics, physical chemistry and metallurgy for chemical engineers. The authors of the chapters on physics of the solid state, plastics and glass, and corrosion deserve special commendation as they have presented their material especially well. On the other hand, the presentation of the material on gas purification leaves much to be desired. If the other volumes are similar to these books, the material will be a fair encyclopedia of chemical engineering for non-chemical engineers. R. E. Peck

Differential Equations

Webster, A. G. PARTIAL DIFFERENTIAL EQUATIONS OF MATHEMATICAL PHYSICS. Dover Publications, Inc. (1956).

In this volume the author attempts to show that there are only a few fundamental partial differential equations ordinarily required in physics and that these are all special cases of a general equation. He mentions it seemed difficult to unify methods associated with Cauchy's use of the Fourier integral and those employing normal functions. These are actually treated as alternative methods. As the following chapter headings show, the volume is a tremendous source book: I) Deduction of the differential equations; II) Equations of the first order; III) Wave equation vibrations and normal functions; IV) Fourier's series and integral. Cauchy's method. Initial data; V) Methods of Green. Potentials. Boundary problems; VI) Method of Riemann-Volterra. Characteristics; VII) Spherical, cylindrical and ellipsoidal harmonics; VIII) Applications of spherical, cylindrical and ellipsoidal harmonics; IX) Theory of integral equations. Author's Abstract

European Energy

Organisation for European Economic Co-operation. EUROPE'S GROWING NEEDS OF ENERGY: HOW CAN THEY BE MET? ENC (56) 63. Paris: O.E.E.C.. (1956) May.

Energy statistics for various European nations are summarized. Reserves and future prospects for the increase and improvement of energy utilization are analyzed. C. G. von Fredersdorff

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Bituminous Coal Research Reports
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British Coal Utilization Research Association Monthly Bulletin and Quarterly Gazette
Butane-Propane News

California Oil World
Canadian Chemical Processing
Canadian Gas Journal
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Canadian Journal of Technology
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